STTH1R04

Ultrafast recovery diode

Features

- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature

Description

The STTH1R04 series uses ST's new 400 V planar Pt doping technology. The STTH1R04 is specially suited for switching mode base drive and transistor circuits.

Packaged in axial and surface mount packages, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.

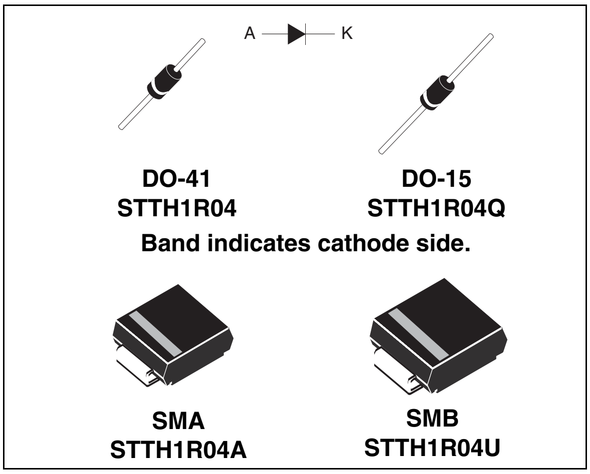


Table 1. Device summary

$I_{F(AV)}$	1 A
V_{RRM}	400 V
$T_{j\ (max)}$	175 °C
$V_{F\ (typ)}$	0.9 V
$t_{rr\ (typ)}$	14 ns

1 Characteristics

Table 2. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			400	V
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	DO-41	$T_{lead} = 100$ °C	1.0	A
		DO-15	$T_{lead} = 105$ °C		
		SMA	$T_{lead} = 125$ °C		
		SMB	$T_{lead} = 140$ °C		
I_{FSM}	Surge non repetitive forward current	$t_p = 10$ ms Sinusoidal		30	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature(1)			175	°C

1. On infinite heatsink with 10 mm lead length

Table 3. Thermal parameters

Symbol	Parameter			Value	Unit
$R_{th(j-l)}$	Junction to lead	Lead length = 10 mm on infinite heatsink	DO-41	55	°C/W
			DO-15	50	
$R_{th(j-l)}$	Junction to lead		SMA	35	
			SMB	25	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
I_R(1)	Reverse leakage current	$T_j = 25$ °C	$V_R = V_{RRM}$			5	µA
		$T_j = 125$ °C			5	50	
V_F(2)	Forward voltage drop	$T_j = 25$ °C	$I_F = 1.0$ A			1.5	V
		$T_j = 100$ °C			1.0	1.25	
		$T_j = 150$ °C			0.9	1.15	

1. Pulse test: $t_p = 5$ ms, $\delta < 2$ %
2. Pulse test: $t_p = 380$ µs, $\delta < 2$ %

To evaluate the conduction losses use the following equation:
$P = 0.9 \times I_{F(AV)} + 0.250 \times I_F{}^2{}_{(RMS)}$

Table 5. Dynamic characteristics (T_j = 25 °C unless otherwise stated)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V, T_j = 25 °C			30	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25 °C		14	20	
I_{RM}	Reverse recovery current	I_F = 1 A, dI_F/dt = -200 A/µs, V_R = 320 V, T_j = 125 °C		2.5	3.5	A
t_{fr}	Forward recovery time	I_F = 1 A dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_{Fmax}, T_j = 25 °C			50	ns
V_{FP}	Forward recovery voltage	I_F = 1 A dI_F/dt = 100 A/µs		3.5		V

Figure 1. Conduction losses versus average forward current

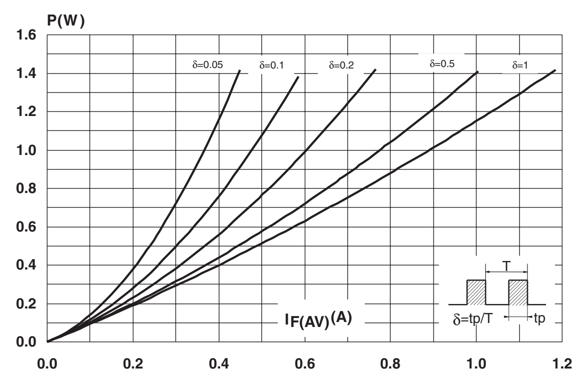


Figure 2. Forward voltage drop versus forward current

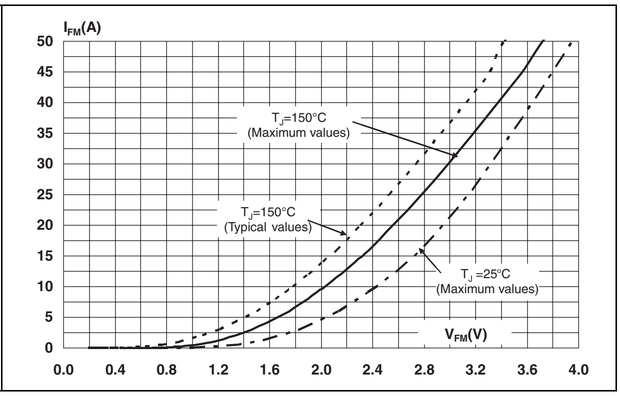


Figure 3. Relative variation of thermal impedance junction to lead versus pulse duration (DO-41)

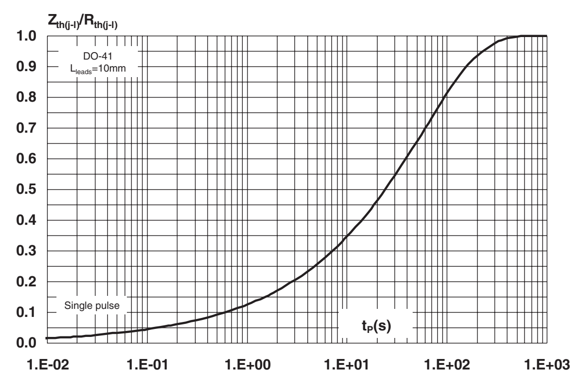


Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (DO-15)

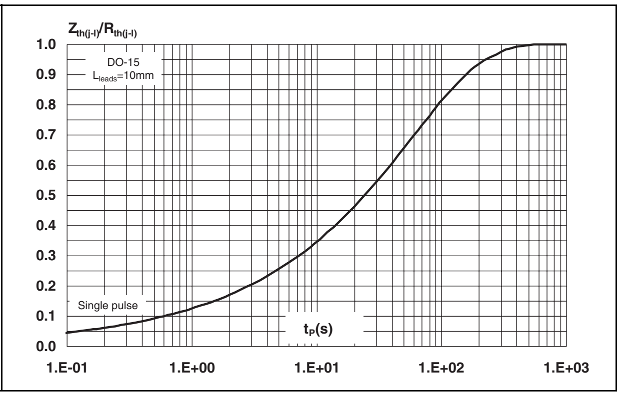


Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration, SMA

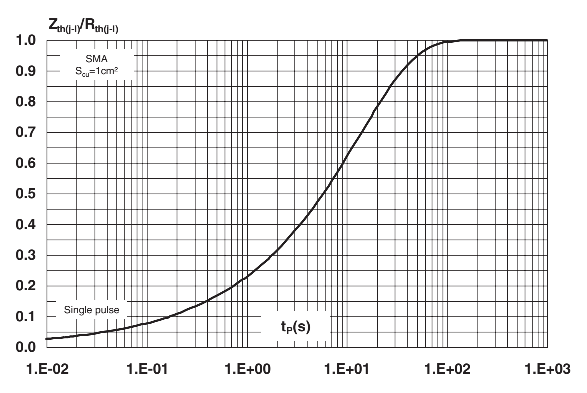


Figure 6. Relative variation of thermal impedance junction to lead versus pulse duration, SMB

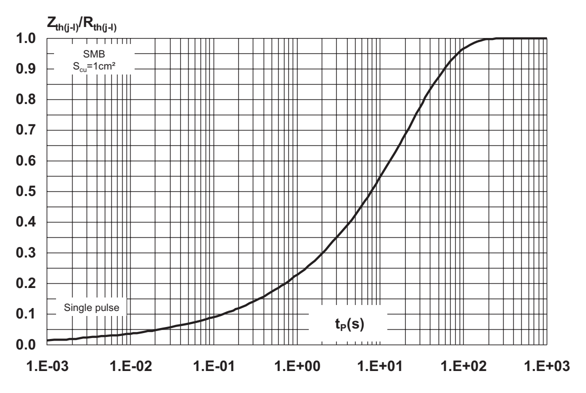


Figure 7. Junction capacitance versus reverse voltage applied (typical values)

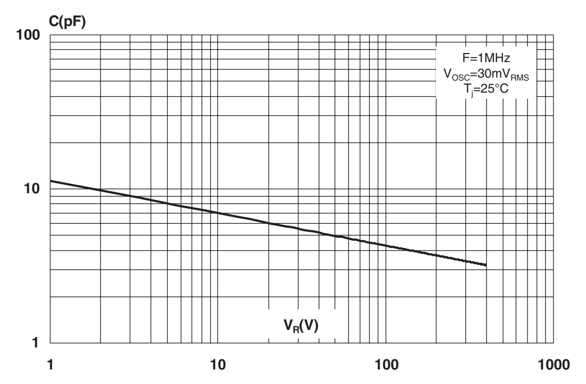


Figure 8. Reverse recovery charges versus dI_F/dt (typical values)

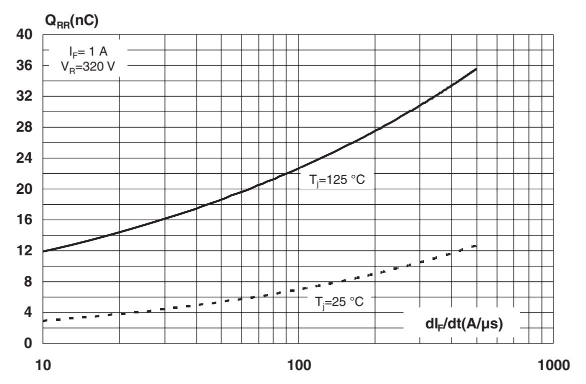


Figure 9. Reverse recovery time versus dI_F/dt (typical values)

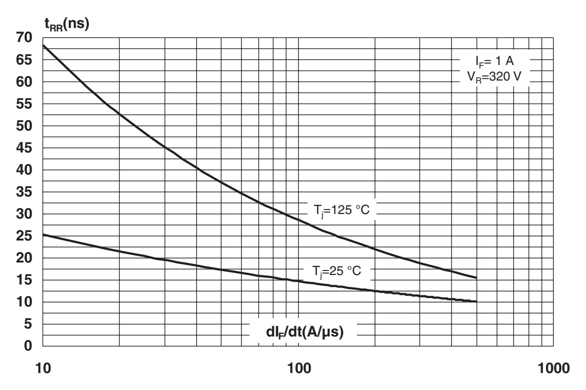


Figure 10. Peak reverse recovery current versus dI_F/dt (typical values)

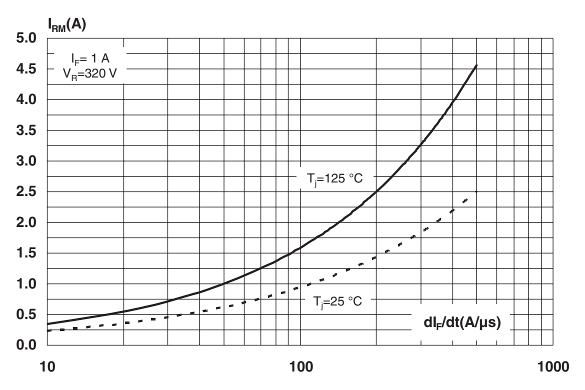


Figure 11. Relative variations of dynamic parameters versus junction temperature

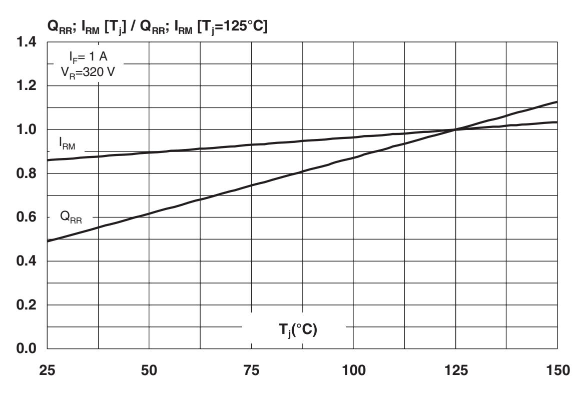


Figure 12. Transient peak forward voltage versus dI_F/dt (typical values)

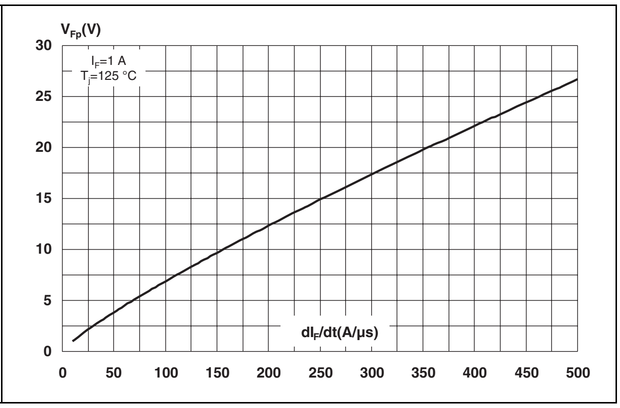


Figure 13. Forward recovery time versus dI_F/dt (typical values)

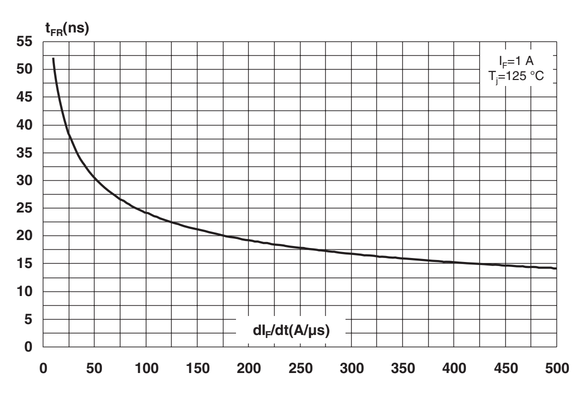


Figure 14. Thermal resistance versus lead length (DO-41)

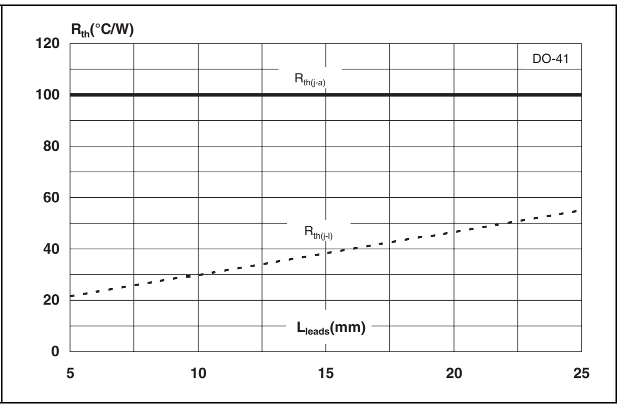


Figure 15. Thermal resistance junction to ambient versus lead length, DO-15

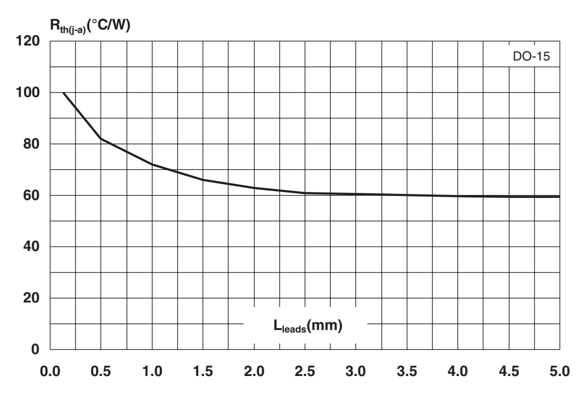
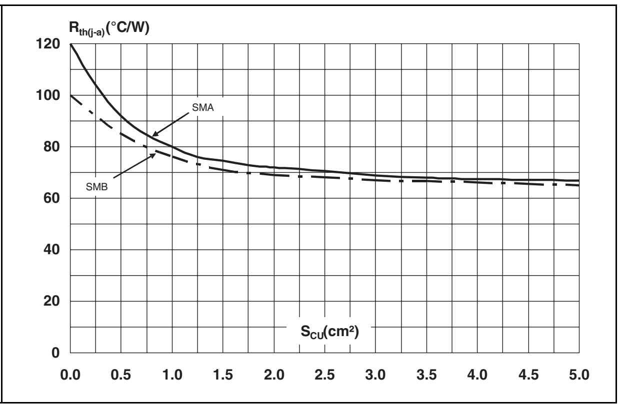


Figure 16. Thermal resistance junction to ambient versus copper surface under each lead, SMA, SMB, (epoxy FR4, copper thickness = 35 µm)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at *www.st.com*.

Table 6. DO-41 (plastic) dimensions

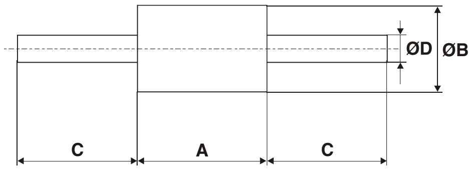
	**Ref.**	**Dimensions**			
		Millimeters		**Inches**	
		Min.	**Max.**	**Min.**	**Max.**
	A	4.1	5.20	0.160	0.205
	B	2	2.71	0.080	0.107
	C	25.4		1	
	D	0.712	0.863	0.028	0.034

Table 7. DO-15 dimensions

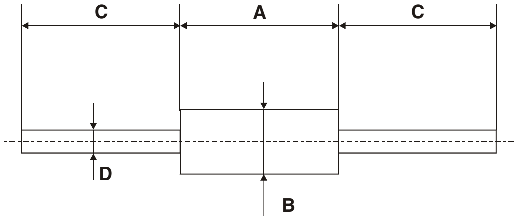
	**Ref.**	**Dimensions**			
		Millimeters		**Inches**	
		Min.	**Max.**	**Min.**	**Max.**
	A	6.05	6.75	0.238	0.266
	B	2.95	3.53	0.116	0.139
	C	26	31	1.024	1.220
	D	0.71	0.88	0.028	0.035

Table 8. SMA dimensions

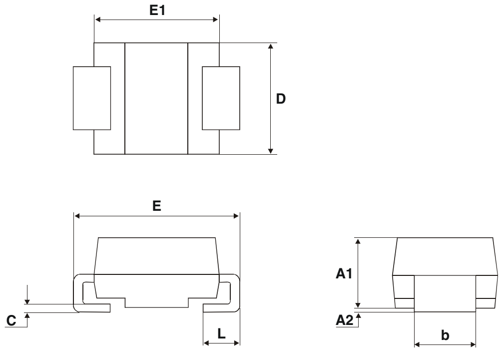
	Ref.	Dimensions			
		Millimeters		Inches	
		Min.	Max.	Min.	Max.
	A1	1.90	2.45	0.075	0.094
	A2	0.05	0.20	0.002	0.008
	b	1.25	1.65	0.049	0.065
	c	0.15	0.40	0.006	0.016
	D	2.25	2.90	0.089	0.114
	E	4.80	5.35	0.189	0.211
	E1	3.95	4.60	0.156	0.181
	L	0.75	1.50	0.030	0.059

Figure 17. Footprint, dimensions in mm (inches)

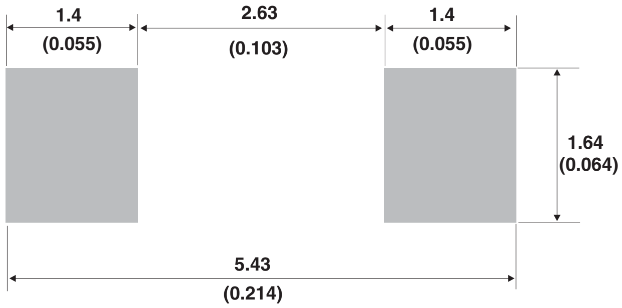


Table 9. SMB dimensions

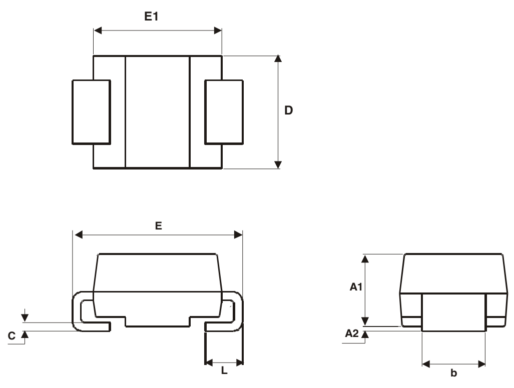
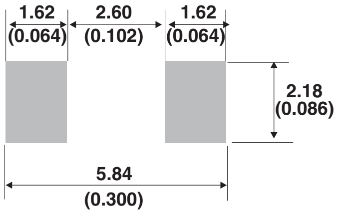
	Ref.	Dimensions			
		Millimeters		Inches	
		Min.	Max.	Min.	Max.
	A1	1.90	2.45	0.075	0.096
	A2	0.05	0.20	0.002	0.008
	b	1.95	2.20	0.077	0.087
	c	0.15	0.40	0.006	0.016
	D	3.30	3.95	0.130	0.156
	E	5.10	5.60	0.201	0.220
	E1	4.05	4.60	0.159	0.181
	L	0.75	1.50	0.030	0.059

Figure 18. Footprint, dimensions in mm (inches)



3 Ordering information

Table 10. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH1R04	STTH1R04	DO-41	0.34 g	1000	Ammopack
STTH1R04RL	STTH1R04	DO-41	0.34 g	5000	Tape and reel
STTH1R04Q	STTH1R04Q	DO-15	0.4 g	1000	Ammopack
STTH1R04QRL	STTH1R04Q	DO-15	0.4 g	6000	Tape and reel
STTH1R04A	HR4	SMA	0.068 g	5000	Tape and reel
STTH1R04U	BR4	SMB	0.12 g	2500	Tape and reel

4 Revision history

Table 11. Document revision history

Date	Revision	Description of changes
30-May-2008	1	First issue

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- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

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